REMARKS/ARGUMENTS

Rejections under 35 USC §103(a)

The Examiner has maintained her rejection of Claims 1-11 and 14-20 over Blaker et al. (U.S. Patent 5,550,870) in view of Hladik et al. (U.S. Patent 5,721,745) and Claims 12 and 13 over Blaker et al. (U.S. Patent 5,550,870) in view of Hladik et al. (U.S. Patent 5,721,745) and Belveze et al. (U.S. Patent 6,389,574).

There are two kinds of algorithms to generate the soft output from a decoder (i) MAP (Maximum A posterior Probability) and (ii) SOVA (Soft Output Viterbi Decoder). The MAP uses two directions processing, forward-and-backward. It also computes exact probability for each bit without any approximation. The drawback for MAP is that decoding latency is very high. The SOVA uses one-direction processing, since it makes selection to choose the survivor path. This selection makes a hard decision on those survivor paths and therefore, the information on the non-survivor path are discarded. This is why SOVA performs worse than MAP. The merit of SOVA is the minimum decoding latency.

The invention of the present application uses one-direction processing of SOVA to achieve the minimum decoding latency, but also uses the exact probability computing for each bit as MAP to achieve the best performance.

The algorithm disclosed by Blaker et al. is a classical Viterbi algorithm which is MLSE (Maximum Likelihood Sequence Estimation) and the output is a hard decision. Belveze et al. discloses an improvement over SOVA. Hladik et al. discloses a pure MAP algorithm.

The Examiner has asserted that Blaker et al. discloses all subject matter as claimed, except for explicitly specifying the vector representation of probabilities, regarding Claims 1, 8, 15 and 18.

Applicant respectfully disagrees and respectfully submits that the classical Viterbi algorithm as disclosed by Blaker et al. and the SOVA used in the method in accordance with the present invention are clearly distinguished.

The classical Viterbi algorithm as disclosed by Blaker et al. is to estimate the *entire coded block* of data and aims to maximize the probability of entire blocks and a hard decision is made. In Blaker et al., the soft output is defined as an accumulated branch metric, namely, the Euclidean distance or Manhattan distance as shown in Table 1 (See col. 7 of Blaker et al.).

On the other hand, the SOVA used in the information processing method and decoding method in accordance with the present invention aims to maximize the decoding probability for each q-ary symbol with each bit and the output of the SOVA is soft value of the *a posteriori* probability. In the SOVA of the instant invention, the soft output is defined as LLR (Logarithm Likelihood Ratio) which is clearly distinct from Blaker et al.

Applicant respectfully submits that although Blaker et al.'s classical Viterbi algorithm and the SOVA used in the information processing method and decoding method in accordance with the present invention provide the soft output, the soft outputs of Viterbi algorithm are completely different metrics with distinct properties and they are not mathematically equivalent to each other. Blaker et al.'s algorithm uses soft branch metric to compute the MLSE decoding, which yields a significantly inferior decoding performance than the SOVA used in the information processing method and decoding method in accordance with the present invention.

In a pure MAP algorithm disclosed by Hladik et al., the path reliability metric is defined as an *approximated* log-logarithmic ratio of the probability. On the other hand, in the SOVA used in the information processing method and decoding method in accordance with the present invention, the path reliability is defined as true LLR without any approximation. Therefore, the SOVA used in the present invention achieves superior performance over the MAP algorithm disclosed by Hladik et al.

Moreover, for the SOVA used in the present invention, *exact* LLR is used to compute the vector probability, the SOVA being different and simpler than Hladik et al.'s MAP which uses *approximated* LLR to compute MAP decoding. Thus, the present invention reduces complexities found in the prior art. Also, the SOVA used in the present invention uses one-direction processing to achieve the *minimum decoding latency*, but also uses the exact

probability computing for each bit as MAP to achieve the best performance. Hladik et al. teaches the turbo decoder art which outperforms Blaker et al.'s decoding, by at least 3 dB signal to noise ratio improvement. The signal processing method and decoding method using the SOVA in accordance with the present invention achieves the same level of performance as the MAT decoding, but without related complexities.

Furthermore, in view of the decoding steps, the fundamental difference between Belveze et al.'s method and the decoding method using the SOVA in accordance with Claim 18 is that the former is the bi-directional decoding and the latter is one-pass decoding.

Thus, the information processing method and decoding method defined in Claims 1, 8, 15 and 18 are differentiated from each of Blaker et al., Hladik et al. and Belveze et al. with respect to the used algorithm and achieved advantages. Applicant respectfully submits that the subject matter defined by Claims 1, 8, 15 and 18 is not obvious from any or a combination of Blaker et al., Hladik et al. and Belveze et al. and thus, Claims 1, 8, 15 and 18 are allowable.

Claims 2-7 depend on Claim 1 with limitations to the features thereof and thus, Claims 2-7 are also allowable.

Claims 9-14 depend directly or indirectly on Claim 8 with limitations to the features thereof and thus, Claims 9-14 are also allowable.

Claims 16 and 17 depend on Claim 15 with limitations to the features thereof and thus, Claims 16 and 17 are also allowable.

Claims 19 and 20 depend on Claim 18 with limitations to the features thereof and thus, Claims 19 and 20 are also allowable.

Conclusion

Applicant respectfully submits that the above arguments are fully responsive to the outstanding Office Action and requests entry thereof. Reconsideration and allowance of Claims 1-20 is solicited. If the Examiner does not receive the foregoing remarks in a positive light, she is earnestly requested to contact the undersigned by telephone in order to advance the application.

The Commissioner is hereby authorized to charge any additional fees, and credit any overpayments to Deposit Account No. 501593, in the name of Borden Ladner Gervais LLP.

Respectfully submitted,

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